

### Trend Study 27-7-03

Study site name: Nephi Pasture Exclosure Outside.

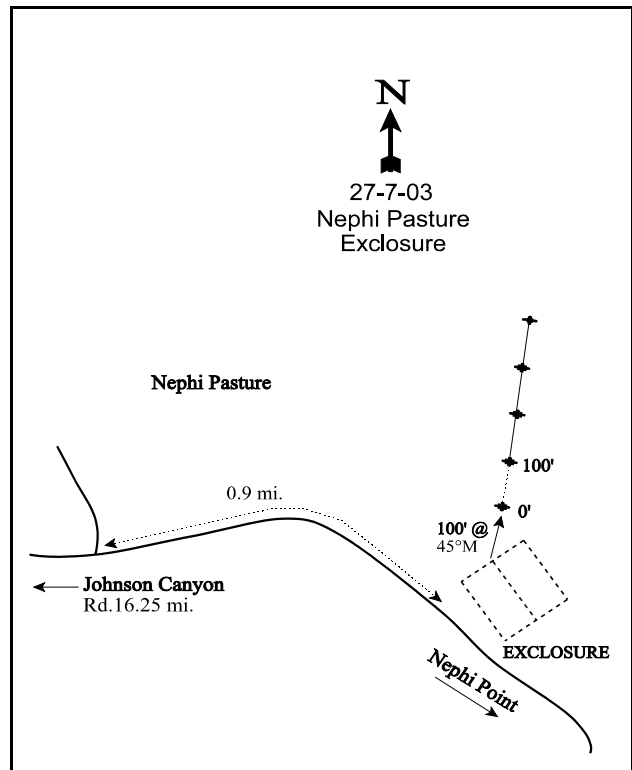
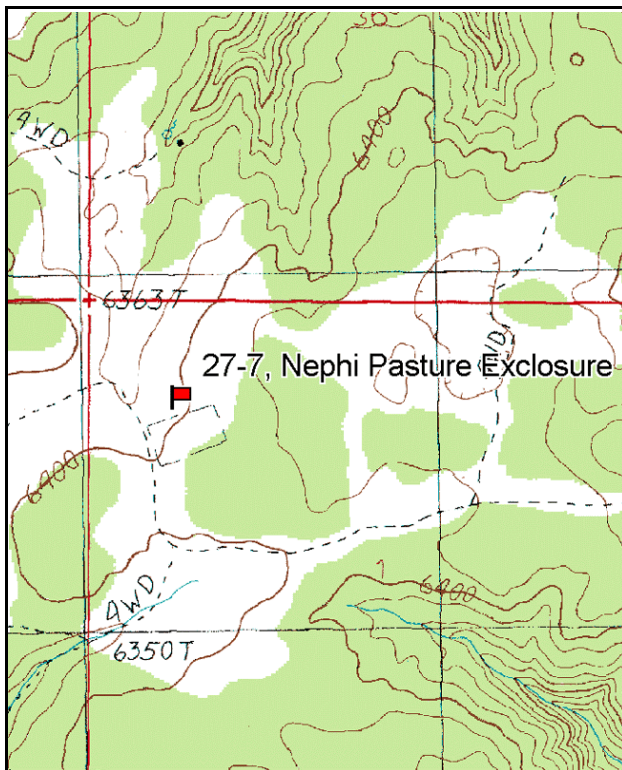
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 4 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

### LOCATION DESCRIPTION

From Kanab, take US 89 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right. Go 16.25 miles (see 27-6-03 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an exclosure. Walk east along the fence on the north side of the exclosure to the inner fence. From the northeast corner of the tallest fence, walk 100 feet northeast to the 0-foot baseline stake, a cut fencepost tagged #7808.



Map Name: Buckskin Mountain

Diagrammatic Sketch

Township 42S, Range 4W, Section 1

GPS: NAD 27, UTM 12S 4116622 N, 394254 E

## DISCUSSION

### Nephi Pasture Exclosure Outside - Trend Study No. 27-7

The Nephi Pasture exclosure complex was built in the 1960's and is found approximately 20 miles northeast of Kanab. This transect samples the outside of the exclosure which is a basin big sagebrush type with a significant bitterbrush component. The study area slopes 5% to the west at an elevation of 6,400 feet. The area is within the Vermillion-Nephi Pasture allotment which is grazed by cattle during the winter. Deer use this area during mild winters, but utilize areas south of US-89 during severe winters. Pellet group data from 1998 estimated 64 deer, 16 cow, and 1 elk days use/acre (158 ddu/ha, 40 cdu/ha, and 3 edu/ha). In 1998, cow sign appeared old and most of the deer pellet groups were from the previous fall and winter. Pellet transect data collected in 2003 estimated 70 deer and 23 cow days use/acre (174 ddu/ha and 57 cdu/ha).

The area was identified by the BLM as an Upland Sand site (11-13 inches precipitation) and a mountain big sagebrush/Indian ricegrass habitat type. On this study, the sagebrush was identified during the readings as basin big sagebrush, not mountain big sagebrush, because of its size and growth form, in addition to the depth of the soils on the site. Typical of all of the Nephi Pasture area, the soil is composed largely of fine sand, formed by aeolian derived sandstone parent materials. It has a loamy sand texture with a moderately acidic pH (5.9). The soil is deep with an effective rooting depth estimated at nearly 21 inches. There are no rock fragments apparent in the profile or on the surface. Soil temperature averaged 60-65°F in 1998 and 2003 at an average depth of 18 inches. Organic matter is limited at only 0.7%. Potassium may be limiting to plant growth at just 38.4 ppm. Values below 70 ppm are thought limiting to normal plant development. There is evidence of wind and surface water erosion, and an erosion condition class assessment rated soils as slightly eroding in 2003.

Serviceberry, basin big sagebrush, and antelope bitterbrush dominate the shrub component. These key species combined to produce 71% of the vegetative cover on the site in 1997, 51% in 1998, and 88% in 2003. Mature serviceberry plants are very large, averaging about 6 feet in height by 6 feet in width. Available parts of these shrubs have been moderately to heavily hedged during all readings, with the heaviest use reported in 1987 (100% heavy use). The increased density reported in 1992 (265 to 980 plants/acre) appears to have been caused by observer differences in counting this rhizomatous shrub. Clumps of several stems in the same area were considered one plant in 1997, 1998, and 2003. Vigor has been good on most plants since 1992, and percent decadence has been fairly low ranging from 10-20% over the same time period. Reproduction has been very good in all surveys ranging from 25-45%. Annual leaders averaged 5 inches of growth on serviceberry outside the exclosure in 2003.

The basin big sagebrush population remained relatively stable at around 1,800 plants/acre from 1987-1998. In 2003, density declined to 1,240 plants/acre resulting from the loss of the entire young age class and a continued abundant dead age class. Since 1992, sagebrush has exhibited generally light to moderate use, but vigor has been poor on a large proportion of the population and decadence has been moderately high ranging from 33%-63%. Half or more of the decadent age class was classified as dying in each of the last 4 readings. Young recruitment was adequate to replace the decadent, dying plants in 1987 and 1992, but has steadily declined since. Basin big sagebrush annual leaders averaged 3.4 inches of growth outside the exclosure in 2003.

Bitterbrush density was stable in 1997 and 1998 at about 1,200 plants/acre, but declined to 960 in 2003 with no young being sampled. Bitterbrush has received consistent moderate to heavy use since 1987, but has maintained generally good vigor and low to moderate decadence. The highest decadence estimates for bitterbrush occurred in the 1992 and 2003 surveys which both followed periods of drought in southern Utah. As this is a winter grazing allotment for livestock, bitterbrush likely receives dual use from big game and cattle in at least some years. Many plants are partly unavailable for use due to the extensive hedging over the years. It was noted in 2003 that all of the available forage on bitterbrush came from the current year leaders. Annual leader growth averaged 7.5 inches on bitterbrush in 2003.

The herbaceous understory had good diversity and fair production from 1987-1998. With drought conditions in 2003, very few grasses or forbs were sampled on the site. The most abundant perennial grasses prior to the 2003 survey were bottlebrush squirreltail, western wheatgrass, sand dropseed, Indian ricegrass, needle-and-thread, and Sandberg bluegrass. Two annual species, cheatgrass and sixweeks fescue, were both moderately abundant in 1997 and 1998, but neither were sampled in 2003 with drought conditions. Forbs have been nearly as abundant on this site as the grasses. Toadflax has been the most abundant perennial forb in all surveys, with all other perennial species being rare. Annual forbs had moderate abundance from 1992-1998, with wooly plantain being the most common. There was light grazing on the palatable grasses in 1998, mainly sand dropseed and western wheatgrass.

### 1992 TREND ASSESSMENT

Percent bare ground is estimated at 27%, down from 39% in 1987. Percent litter cover is similar to 1987 estimates. Trend for soil is considered slightly up, but still in poor condition. Because the sample size is much larger now, many of the estimates for browse density have increased from the 1987 survey. Therefore, percent decadence, form class, and vigor should be the parameters most important for trend evaluation. The key species for the site in order of dominance (percent of total plant cover) are: serviceberry (33%), basin big sagebrush (32%) and bitterbrush (18%). Basin big sagebrush has the highest decadence, but is not higher than expected with the site potential and condition, along with the length of the current drought. The key species also all have some evidence of reproduction and a good percent young age class of plants. The trend for browse would be considered stable. For the herbaceous understory, annuals in the past were ignored in the surveys. Now, if we “ignore” the annuals and look at the trend for only perennial species, the sum of nested frequencies would indicate a stable trend.

#### TREND ASSESSMENT

soil - up slightly (4)

browse - stable (3)

herbaceous understory - stable (3)

### 1997 TREND ASSESSMENT

Trend for soil is considered stable even with an increase in percent bare ground. Nested frequency of vegetation and litter increased as did the sum of nested frequency for grasses and forbs. There is some evidence of soil pedestalling, but much of this appears to be caused by livestock trails around shrubs. Erosion is not currently a problem on the site. Trend for the key browse species is mixed. Bitterbrush and serviceberry appear to be stable with moderate to heavy use, good vigor, and low decadence. The increase in density between 1992 and 1997 appear to be observer differences due to the lack of dead plants. This rhizomatous shrub can be difficult to count when in dense clusters. Several stems coming from the same general area were considered one plant in 1997. Basin big sagebrush appears to have a declining trend with a reduced population density, moderate to heavy use, reduced vigor, and increasing decadence. In addition, the large number of dead plants counted in 1997 indicate a definite die-off. A decline in density can also be seen in all age classes. Since sagebrush accounts for one third of the shrub cover, the browse trend is considered slightly down. The herbaceous trend is stable but still depleted. Sum of nested frequency for grasses increased, although this was due to a significant increase in the nested frequencies of cheatgrass and sixweeks fescue. The most common native grass, bottlebrush squirreltail, increased slightly. Sum of nested frequency for forbs also increased slightly, due mainly to a significant increase in the nested frequency of toadflax.

#### TREND ASSESSMENT

soil - stable (3)

browse - down for sagebrush, slightly down overall (2)

herbaceous understory - stable (3)

## 1998 TREND ASSESSMENT

Trend for soil appears up slightly due to a decline in percent bare ground from 36% to 31%, combined with an increase in vegetation and cryptogamic cover. Conditions are still poor however. Trend for the key browse species are similar to 1997 estimates. Utah serviceberry and antelope bitterbrush trends appear stable. Bitterbrush does show extremely heavy use, but vigor is good, reproduction adequate, and percent decadence low at only 13%. The sagebrush population has remained at a similar density since 1987, but the population has become increasingly decadent (46%), and 43% of the sagebrush are dead (1,440 plants/acre). This combined with poor reproduction in 1997 and 1998 point to a decline. This decline does not appear to be caused by utilization because the livestock exclosure and total exclosure also show similar trends. Overall browse trend is considered stable since conditions for sagebrush are similar to 1997. However, the sagebrush population should be watched closely. Trend for the herbaceous understory is stable, although in poor condition. Sum of nested frequency for perennial grasses and forbs are similar to 1997 estimates. One negative factor is the significant increase in nested frequency for the annuals; cheatgrass, sixweeks fescue, and wooly plantain.

### TREND ASSESSMENT

soil - slightly up (4)

browse - stable (3)

herbaceous understory - stable (3)

## 2003 TREND ASSESSMENT

Trend for soil is down. Bare ground increased from 31% to 45%, and vegetation cover declined from 35% to 21%. As a result, there is less protective cover on the soil surface and erosion is evident from rills, surface litter movement, and pedestalling. Trend for browse is slightly down. The 3 key species, serviceberry, bitterbrush, and basin big sagebrush all have lower population densities since 1998, and bitterbrush and basin big sagebrush have much lower young recruitment. Percent decadence increased for all 3 species in 2003, although sagebrush is the only species of the three that would be considered as having high decadence. Utilization on sagebrush is mostly light, moderate for serviceberry, and heavy on bitterbrush. One-third of the basin big sagebrush population showed poor vigor in 2003, and 59% of the decadent age class was classified as dying. Because basin big sagebrush is the least preferred of the key species, the deteriorating condition of this population is not as alarming as it may be on other sites without a good bitterbrush and/or serviceberry component. Trend for the herbaceous understory is down. Most perennial grass and forb species showed lower individual nested frequency values in 2003 compared to 1998, and total sum of nested frequency of all perennials declined from 336 to 155. Annual species also declined in abundance. The effect of drought on both the browse and herbaceous components is obvious.

### TREND ASSESSMENT

soil - down (1)

browse - slightly down (2)

herbaceous understory - down (1)

HERBACEOUS TRENDS --  
Management unit 27 , Study no: 7

T y p e	Species	Nested Frequency					Average Cover %			
		'87	'92	'97	'98	'03	'92	'97	'98	'03
G	Agropyron smithii	ab <sup>24</sup>	a <sup>4</sup>	bc <sup>48</sup>	c <sup>71</sup>	a <sup>10</sup>	.03	.29	.50	.07
G	Bromus tectorum (a)	-	a <sup>3</sup>	b <sup>112</sup>	c <sup>144</sup>	a <sup>-</sup>	.00	2.35	3.21	-
G	Oryzopsis hymenoides	11	25	21	14	16	.34	.10	.25	.21
G	Poa secunda	8	12	16	15	3	.10	.39	.10	.01
G	Sitanion hystrix	b <sup>54</sup>	b <sup>58</sup>	b <sup>62</sup>	b <sup>39</sup>	a <sup>-</sup>	.51	.83	.62	-
G	Sporobolus cryptandrus	ab <sup>24</sup>	b <sup>33</sup>	ab <sup>14</sup>	b <sup>31</sup>	a <sup>9</sup>	.63	.06	.33	.07
G	Stipa comata	22	24	25	21	7	.32	.14	.16	.03
G	Vulpia octoflora (a)	-	b <sup>27</sup>	c <sup>73</sup>	d <sup>144</sup>	a <sup>-</sup>	.11	.33	1.92	-
Total for Annual Grasses		0	30	185	288	0	0.11	2.69	5.13	0
Total for Perennial Grasses		143	156	186	191	45	1.94	1.82	1.97	0.40
Total for Grasses		143	186	371	479	45	2.06	4.51	7.10	0.40
F	Arabis spp.	-	-	5	3	-	-	.04	.01	-
F	Astragalus spp.	8	2	1	1	3	.00	.00	.00	.00
F	Calochortus nuttallii	-	-	1	-	4	-	.01	-	.01
F	Chaenactis douglasii	-	2	1	10	-	.01	.00	.19	-
F	Collomia linearis (a)	-	-	3	-	-	-	.00	-	-
F	Comandra pallida	ab <sup>72</sup>	a <sup>58</sup>	b <sup>117</sup>	b <sup>98</sup>	ab <sup>88</sup>	.50	1.79	1.04	1.42
F	Collinsia parviflora (a)	-	-	1	-	2	-	.15	-	.03
F	Delphinium nuttallianum	-	-	3	-	-	-	.00	-	-
F	Descurainia spp. (a)	-	b <sup>16</sup>	b <sup>30</sup>	b <sup>26</sup>	a <sup>-</sup>	.40	.12	.13	-
F	Draba spp. (a)	-	b <sup>16</sup>	a <sup>-</sup>	ab <sup>8</sup>	a <sup>-</sup>	.03	-	.04	-
F	Eriogonum cernuum (a)	-	b <sup>33</sup>	a <sup>10</sup>	a <sup>1</sup>	a <sup>2</sup>	.24	.05	.00	.03
F	Erigeron spp.	-	-	1	3	-	-	.00	.00	-
F	Eriogonum racemosum	1	-	7	4	-	-	.04	.01	-
F	Euphorbia glyptosperma (a)	b <sup>17</sup>	ab <sup>8</sup>	a <sup>-</sup>	a <sup>-</sup>	a <sup>-</sup>	.04	-	-	-
F	Frasera speciosa	-	-	2	-	-	-	.00	-	-
F	Gilia spp. (a)	-	a <sup>-</sup>	b <sup>24</sup>	a <sup>-</sup>	b <sup>11</sup>	-	.12	-	.28
F	Lappula occidentalis (a)	-	-	4	-	-	-	.04	-	-
F	Lupinus argenteus	-	-	1	-	-	.03	.03	-	-
F	Microsteris gracilis (a)	-	b <sup>21</sup>	b <sup>31</sup>	a <sup>-</sup>	a <sup>-</sup>	.04	.15	-	-
F	Oenothera pallida	-	3	-	3	3	.03	-	.03	.00
F	Penstemon spp.	a <sup>-</sup>	b <sup>10</sup>	a <sup>-</sup>	ab <sup>8</sup>	ab <sup>-</sup>	.22	-	.04	-
F	Phlox austromontana	a <sup>-</sup>	b <sup>14</sup>	b <sup>22</sup>	b <sup>14</sup>	ab <sup>9</sup>	.30	.20	.35	.09
F	Plantago patagonica (a)	-	c <sup>88</sup>	b <sup>46</sup>	d <sup>195</sup>	a <sup>2</sup>	.40	.18	5.36	.03
F	Polygonum douglasii (a)	-	b <sup>15</sup>	b <sup>26</sup>	a <sup>-</sup>	a <sup>-</sup>	.03	.04	-	-

T y p e	Species	Nested Frequency					Average Cover %			
		'87	'92	'97	'98	'03	'92	'97	'98	'03
F	Senecio multilobatus	4	-	1	-	-	-	.00	-	-
F	Sphaeralcea parvifolia	<sub>b</sub> 12	<sub>ab</sub> 3	<sub>a</sub> 1	<sub>a</sub> 1	<sub>ab</sub> 3	.01	.00	.00	.03
F	Unknown forb-annual (a)	-	3	-	-	-	.01	-	-	-
Total for Annual Forbs		17	200	175	230	17	1.21	0.88	5.54	0.37
Total for Perennial Forbs		97	92	163	145	110	1.11	2.15	1.69	1.56
Total for Forbs		114	292	338	375	127	2.32	3.04	7.24	1.93

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 27 , Study no: 7

T y p e	Species	Strip Frequency				Average Cover %			
		'92	'97	'98	'03	'92	'97	'98	'03
B	Amelanchier utahensis	23	13	13	11	12.05	8.44	3.32	5.71
B	Artemisia filifolia	0	0	3	0	-	-	.18	-
B	Artemisia tridentata tridentata	58	58	55	46	11.92	5.20	3.20	5.41
B	Chrysothamnus nauseosus	0	0	0	1	-	-	-	.00
B	Chrysothamnus viscidiflorus	0	1	1	0	-	.00	-	-
B	Eriogonum microthecum	0	0	1	0	-	-	-	-
B	Gutierrezia sarothrae	34	32	27	4	1.53	.26	.68	.03
B	Leptodactylon pungens	3	5	0	4	.06	.06	-	.06
B	Opuntia spp.	1	0	0	1	-	-	-	-
B	Purshia tridentata	36	34	37	34	6.50	6.59	7.64	7.50
Total for Browse		155	143	137	101	32.08	20.58	15.03	18.73

#### CANOPY COVER, LINE INTERCEPT --

Management unit 27 , Study no: 7

Species	Percent Cover
	'03
Amelanchier utahensis	8.19
Artemisia tridentata tridentata	8.03
Chrysothamnus nauseosus	.05
Purshia tridentata	7.71

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 27 , Study no: 7

Species	Average leader growth (in)
	'03
Amelanchier utahensis	3.9
Artemisia tridentata tridentata	2.2
Purshia tridentata	6.1

POINT-QUARTER TREE DATA --  
Management unit 27 , Study no: 7

Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniper osteosperma	6	N/A	8.5	N/A

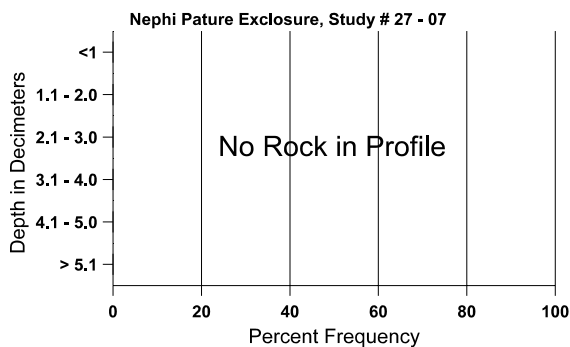
BASIC COVER --  
Management unit 27 , Study no: 7

Cover Type	Average Cover %				
	'87	'92	'97	'98	'03
Vegetation	.75	34.50	27.35	34.91	20.50
Rock	0	.04	.05	0	.03
Pavement	0	0	.02	.04	.01
Litter	59.75	54.40	47.79	48.41	47.10
Cryptogams	1.00	2.00	1.93	8.56	.67
Bare Ground	38.50	26.89	35.68	30.71	45.26

SOIL ANALYSIS DATA --  
Management unit 27, Study no: 7, Study Name: Nephi Pasture Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.8	65.0 (18.1)	5.9	87.0	7.4	5.6	0.7	11.9	38.4	0.2

## Stoniness Index



PELLET GROUP DATA --

Management unit 27 , Study no: 7

Type	Quadrat Frequency			
	'92	'97	'98	'03
Rabbit	49	20	25	8
Elk	-	-	-	-
Deer	26	32	27	23
Cattle	3	5	5	5

Days use per acre (ha)	
'98	'03
-	-
1 (2)	-
64 (158)	70 (174)
16 (40)	23 (57)

BROWSE CHARACTERISTICS --

Management unit 27 , Study no: 7

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<b>Amelanchier utahensis</b>											
87	<b>265</b>	66	66	133	66	-	0	100	25	25	60/56
92	<b>980</b>	120	440	440	100	-	18	18	10	10	-/-
97	<b>340</b>	-	100	200	40	20	47	18	12	12	83/86
98	<b>380</b>	20	120	220	40	-	26	21	11	0	66/73
03	<b>300</b>	-	80	160	60	20	60	7	20	7	70/72
<b>Artemisia filifolia</b>											
87	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>260</b>	60	140	120	-	-	0	0	-	0	9/15
03	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
<b>Artemisia tridentata tridentata</b>											
87	<b>1865</b>	66	466	1266	133	-	54	21	7	0	34/35
92	<b>2720</b>	200	800	1020	900	-	15	1	33	24	-/-
97	<b>1700</b>	20	320	600	780	1200	53	11	46	46	36/45
98	<b>1880</b>	100	240	780	860	1440	40	9	46	23	31/37
03	<b>1240</b>	-	-	460	780	1500	15	0	63	37	31/34
<b>Chrysothamnus nauseosus</b>											
87	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
03	<b>20</b>	-	-	20	-	-	0	0	-	0	-/-



		Age class distribution (plants per acre)					Utilization				
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<b>Chrysanthamnus viscidiflorus</b>											
87	<b>133</b>	66	133	-	-	-	0	0	-	50	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
97	<b>20</b>	-	-	20	-	-	0	0	-	0	7/7
98	<b>20</b>	-	-	20	-	-	0	0	-	0	18/13
03	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
<b>Eriogonum microthecum</b>											
87	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>20</b>	-	-	20	-	-	0	100	-	0	-/-
03	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
<b>Gutierrezia sarothrae</b>											
87	<b>3932</b>	66	-	3866	66	-	0	0	2	0	9/12
92	<b>1180</b>	200	120	1040	20	-	0	0	2	0	-/-
97	<b>1280</b>	20	180	1060	40	60	0	0	3	0	11/12
98	<b>1280</b>	20	40	1240	-	-	0	0	0	0	11/13
03	<b>120</b>	-	40	80	-	-	0	0	0	0	11/14
<b>Leptodactylon pungens</b>											
87	<b>599</b>	533	133	400	66	-	0	0	11	0	5/6
92	<b>340</b>	-	20	320	-	-	0	0	0	0	-/-
97	<b>280</b>	-	-	280	-	20	0	0	0	7	18/20
98	<b>0</b>	-	-	-	-	-	0	0	0	0	-/-
03	<b>180</b>	-	-	180	-	20	0	0	0	0	5/7
<b>Opuntia spp.</b>											
87	<b>0</b>	-	-	-	-	-	0	0	0	0	-/-
92	<b>40</b>	-	20	-	20	-	0	0	50	50	-/-
97	<b>0</b>	-	-	-	-	-	0	0	0	0	-/-
98	<b>0</b>	-	-	-	-	-	0	0	0	0	4/13
03	<b>20</b>	-	-	20	-	-	0	0	0	0	2/3
<b>Purshia tridentata</b>											
87	<b>1466</b>	-	400	1000	66	-	0	100	5	0	12/41
92	<b>1700</b>	40	420	840	440	-	13	80	26	16	-/-
97	<b>1240</b>	-	80	1060	100	40	35	55	8	8	21/43
98	<b>1220</b>	-	120	940	160	40	18	75	13	2	20/43
03	<b>960</b>	-	-	640	320	60	29	71	33	8	20/38

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Ribes spp.											
87	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	30/25
03	0	-	-	-	-	-	0	0	-	0	-/-
Tetradymia canescens											
87	0	-	-	-	-	-	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	-	0	-/-
97	0	-	-	-	-	-	0	0	-	0	-/-
98	0	-	-	-	-	-	0	0	-	0	-/-
03	0	-	-	-	-	-	0	0	-	0	19/7

## Nephi Pasture Exclosure Comparison Summary

Ground cover characteristics differ slightly between grazing effects. Bare ground is more abundant outside of the exclosure, and similar between the livestock and total exclosures in both 1998 and 2003. Vegetation and litter cover are highest in the livestock exclosure and lowest outside. Soil characteristics are similar between treatments. Soils are deep with sandy loam to sand textures, a moderately acidic pH, low organic matter content, deficient values for phosphorus and potassium, and high average soil temperatures. The total exclosure showed the least amount of erosion in 2003, while both the livestock exclosure and outside treatments showed slight erosion.

All sites support good stands of basin big sagebrush, bitterbrush, and serviceberry, with sagebrush being the most prevalent. In 1998, the sagebrush stand in the total exclosure was the least healthy followed closely by outside. Percent decadence was high at 64% in the total exclosure compared to 34% in the livestock exclosure and 46% outside. Vigor was poor on 46% of the total exclosure population, compared to 18% in the livestock, and 23% outside. Utilization was moderate to heavy outside and within the livestock exclosure. In 1998, deer use was significantly higher within the livestock exclosure (111 ddu/acre vs 64 ddu/acre) where sagebrush was in the best condition. With this in mind, it appeared that sagebrush was more effected by climate in 1998 than use. In 2003, sagebrush decadence was high in all 3 treatments at over 50%, with the highest level occurring inside the livestock exclosure. Poor vigor was also highest inside the livestock exclosure with 51% of the sagebrush being classified as such. Young recruitment for sagebrush was good in all 3 treatments in 1998, but very low in 2003. Density was highest inside the livestock exclosure in both surveys, but density estimates declined over all 3 treatments between 1998 and 2003.

Several factors appear to be effecting sagebrush at Nephi Pasture. Drought is likely the primary driving force behind deteriorating sagebrush health, but winter injury could also be a factor. Winter injury is presumably caused by freezing due to a lack of sufficient cold hardiness and/or winter drought or dessication (Nelson and Tiernan 1983). During mild winters, sagebrush can break dormancy during the middle of the winter and begin growth too early in the year. By doing so, sagebrush plants become susceptible to dessication and crown death if temperatures become very cold for any substantial length of time or there is a lack of soil moisture within the profile, especially within these deep sandy soils. In 2003, the livestock exclosure appears to be a little worse off than the other treatments. A plausible explanation is that heavy deer use as well as high intraspecific competition are additive factors effecting sagebrush in the livestock exclosure. Because overall browse density and average cover are highest inside the livestock exclosure, competition for resources would be greatest here, and this would be intensified during the current drought.

Bitterbrush density slightly declined in the total exclosure and outside, but remained stable in the livestock exclosure between 1998 and 2003. Serviceberry showed slight decreases in all 3 treatments in 2003. Although both species had increased decadence rates in 2003, the current levels are considered only moderate. Utilization has been on the moderate side for serviceberry in the livestock exclosure and outside, but more heavy on bitterbrush. However, vigor has been generally normal for both species across all treatments in both sampling years. Bitterbrush recruitment declined in all 3 treatments between 1998 and 2003, while young recruitment in the serviceberry population remained stable in the livestock exclosure and outside.

The herbaceous understories were similar with respect to species composition and overall production between grazing effects in 1998. With drought in 2003, grass production declined drastically on all 3 transects, with forb production declining in the livestock exclosure and outside, but remaining nearly the same inside the total exclosure. Sum of nested frequency of perennial herbaceous species declined across all 3 treatments in 2003 with the dry conditions. Cheatgrass had the highest frequency and cover values inside the total exclosure in 1998, but cheatgrass was not sampled in any of the 3 transects in 2003. Herbaceous trends are down on all 3 sites in 2003 due to the decline in perennial species.